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Tamura et al.

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[54] **DISPLAY CABINET**

[75] Inventors: **Fumiyasu Tamura; Kenichi Nara; Ryoichi Takahashi,** all of Maebashi, Japan

[73] Assignee: **Sanden Corporation,** Gunma, Japan

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Mar. 3, 1986 [JP] Japan ..... 61-30218[U]

[51] **Int. Cl.**[4] **A47F 3/04**
[52] **U.S. Cl.** **312/116;** 312/236
[58] **Field of Search** ..... 165/918, 919, 48 R; 62/252–254; 312/116, 236, 223

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Primary Examiner—Joseph Falk

Attorney, Agent, or Firm—Banner, Birch, McKie & Beckett

[57] **ABSTRACT**

A display case is provided with a compartment which stores merchandise for display and is divided into at least two chambers by a partition plate to enable storing different types of merchandise, each of which types is to be held under a predetermined temperature. These chambers communicate with one another through a communication gap which is defined between the partition plate and the window of the case and the opening and closing of the gap is controlled by a sealing mechanism to vary the temperature conditions within each chamber. The sealing mechanism includes a sealing element which is movably engaged with the partition plate and a retaining element is fastened on the partition plate to hold the selected position of the sealing element. Thus, the opening and closing control of the gap is easily operated without interfering with the visibility of the merchandise.

9 Claims, 6 Drawing Sheets

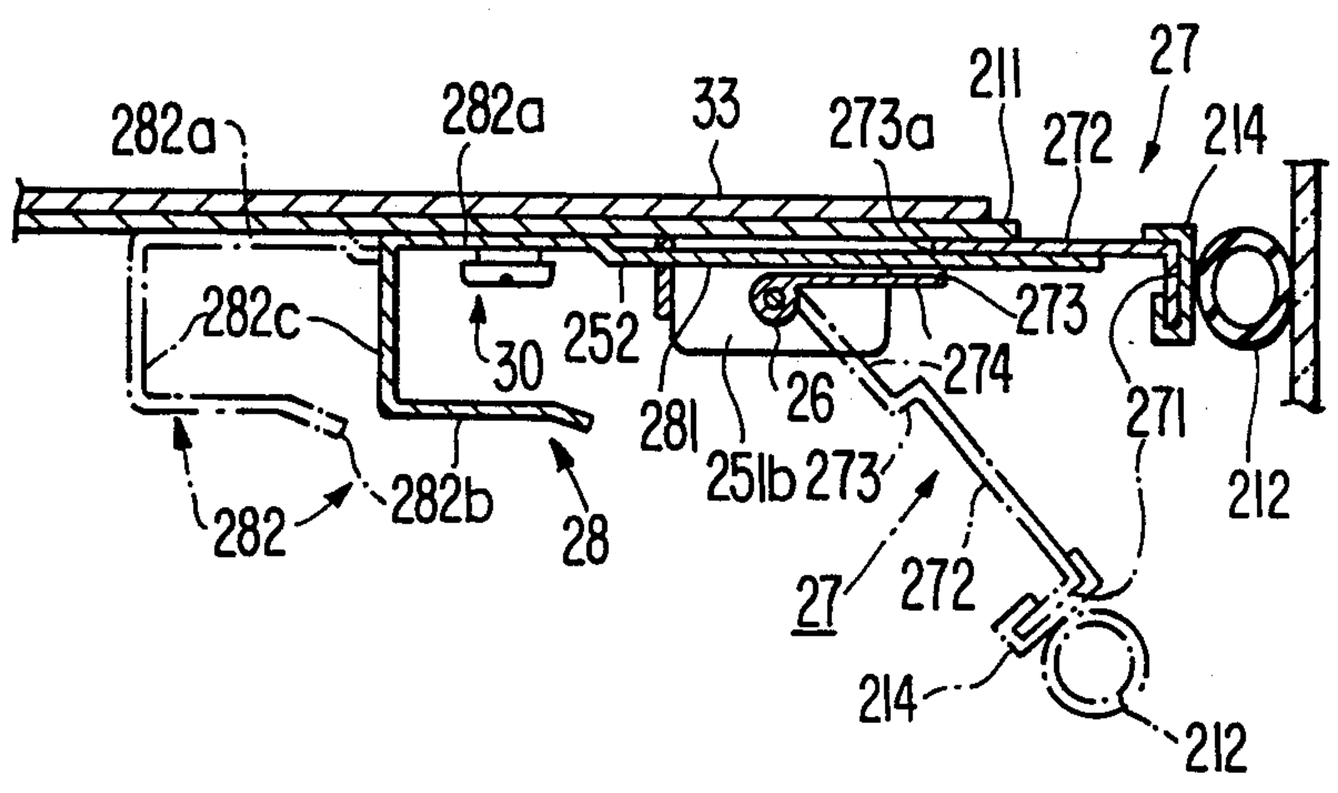


FIG. 1.
(PRIOR ART)

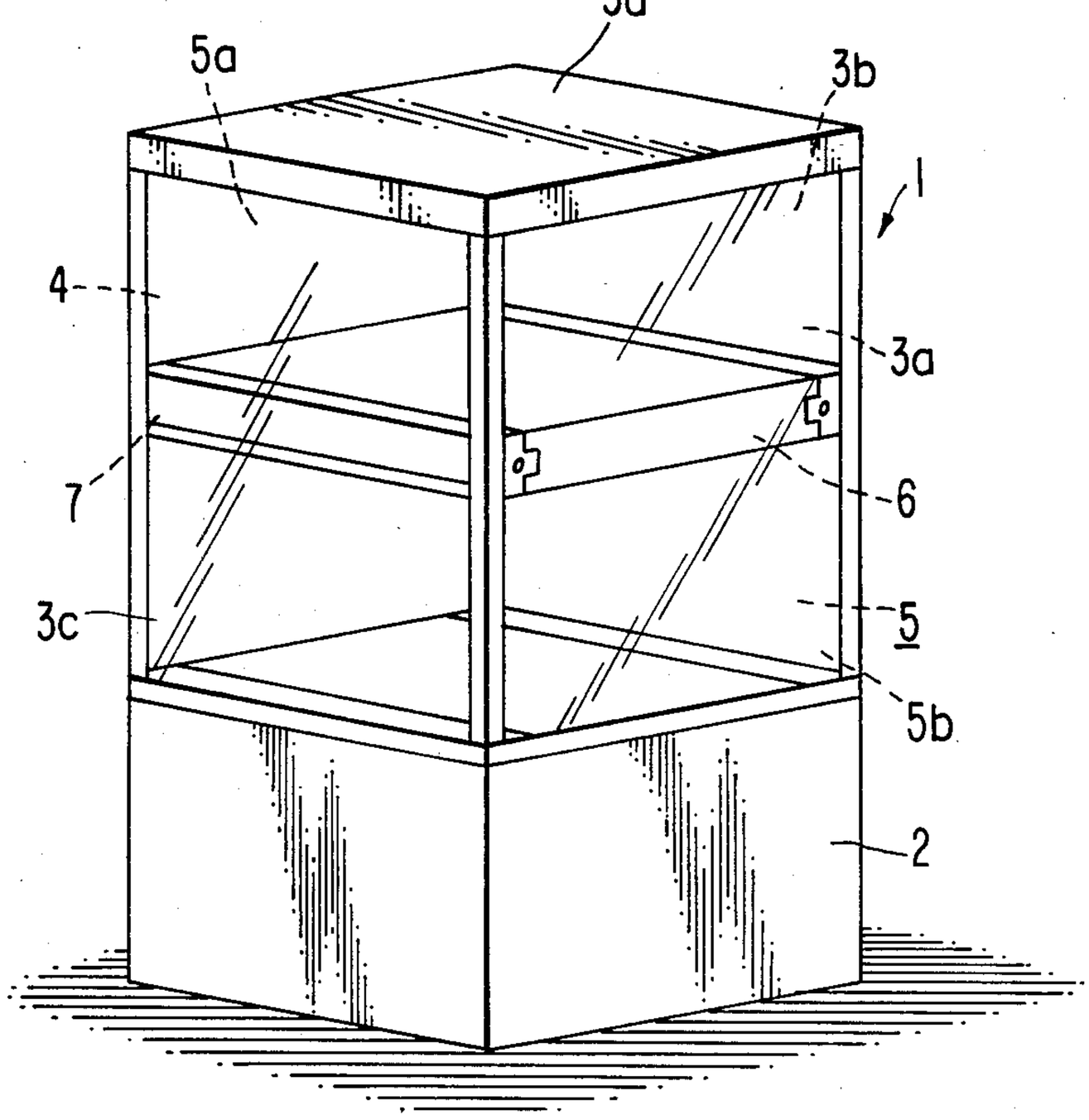


FIG. 2.
(PRIOR ART)

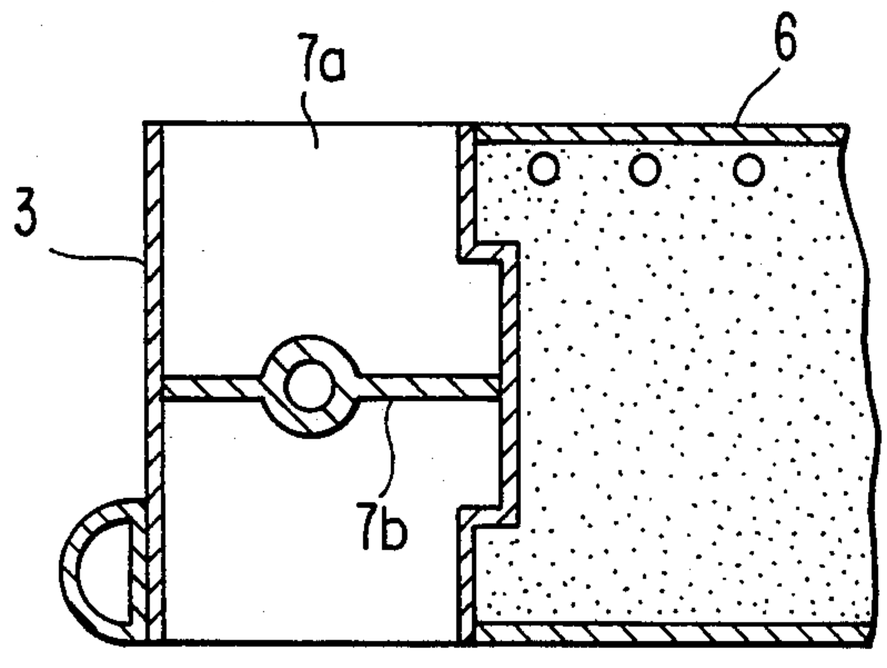


FIG. 3.

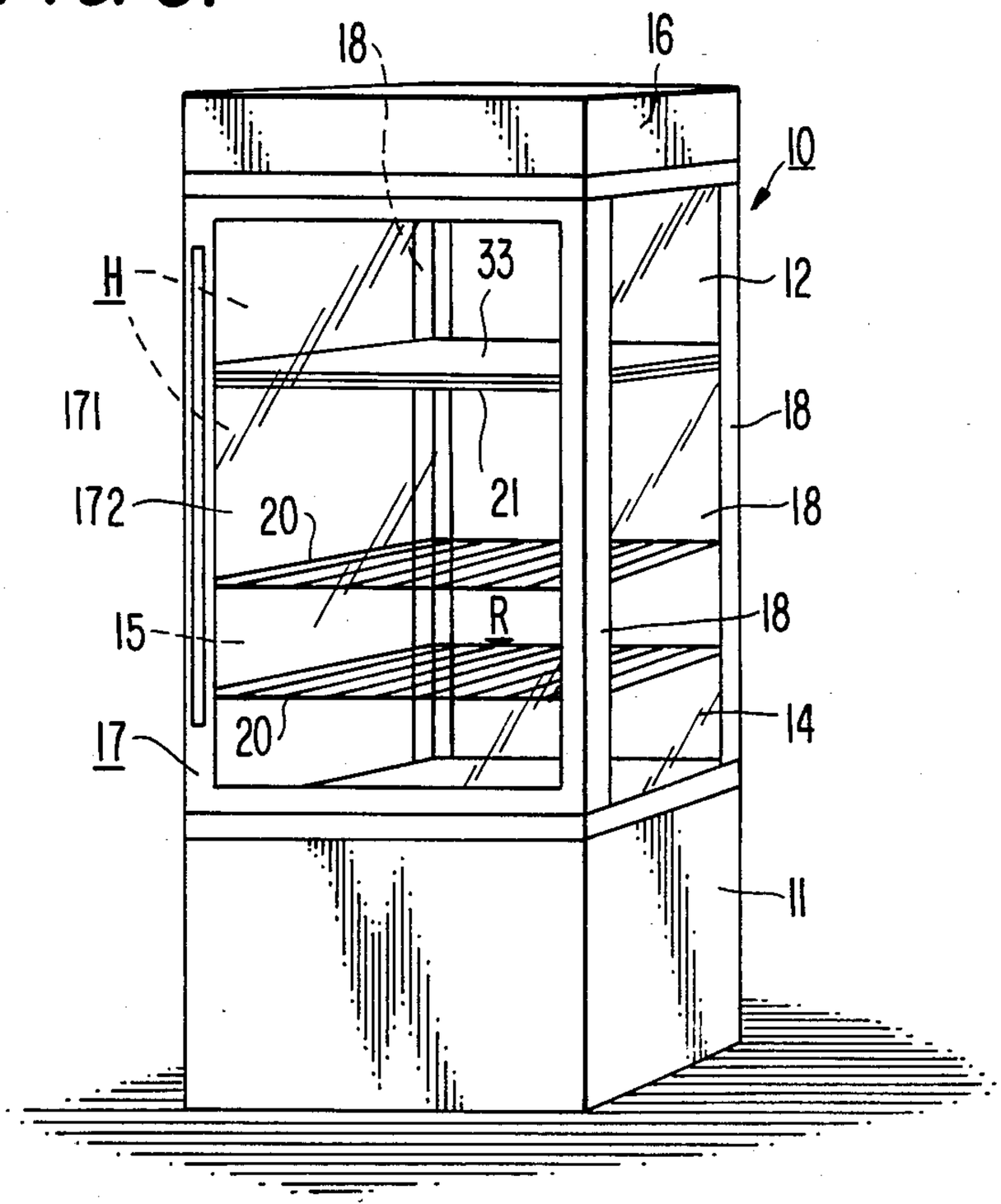

18
16
10
H
33
12
171
18
172
20
21
18
15
R
18
20
14
17
11

FIG. 5.

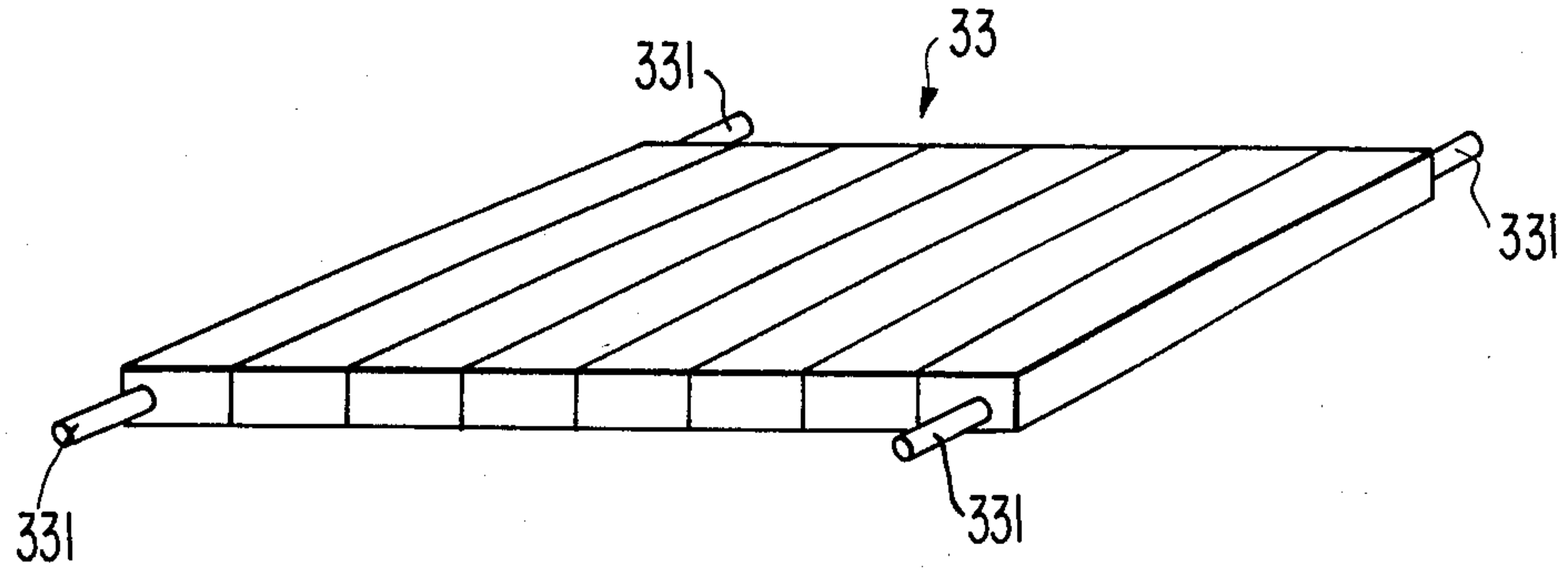

331
33
331
331
331

FIG. 4(a).

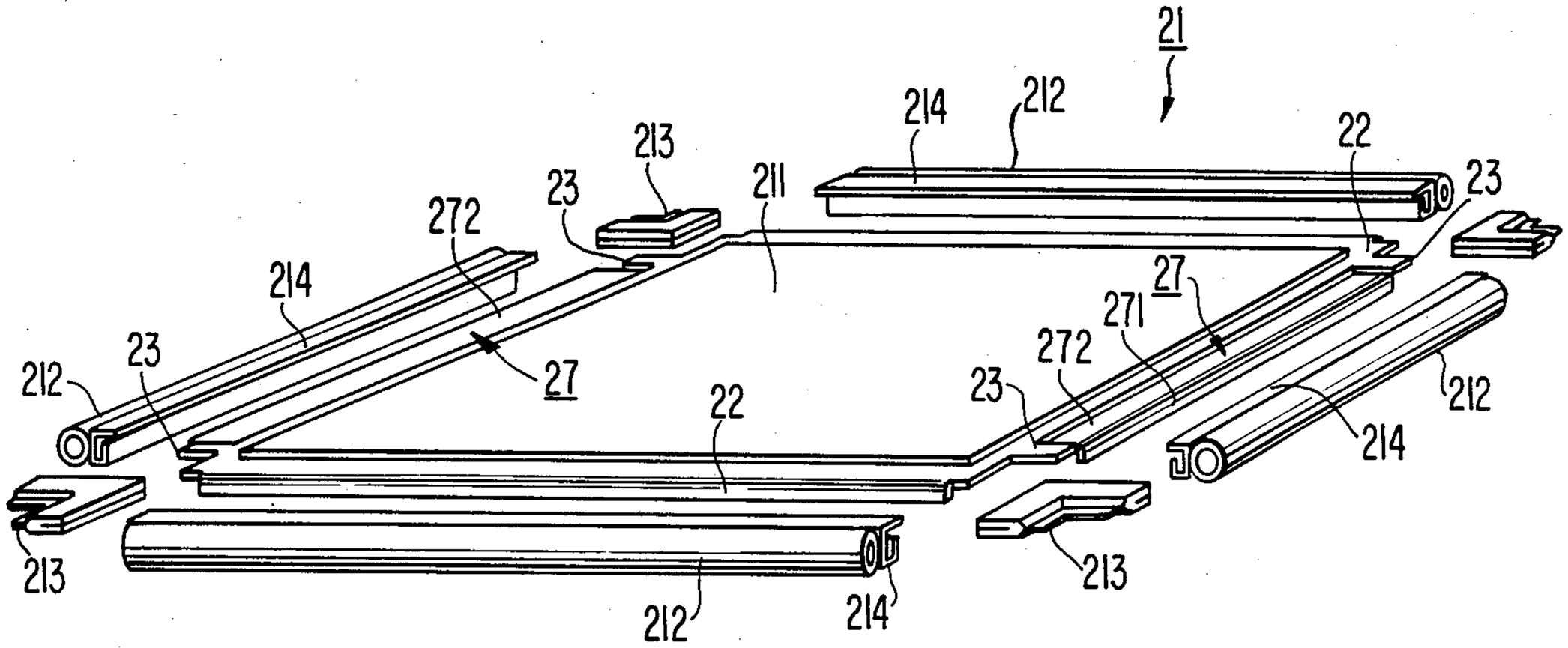

21
214
212
213
23
272
211
22
27
271
212
214
213
212
214

FIG. 4(b).

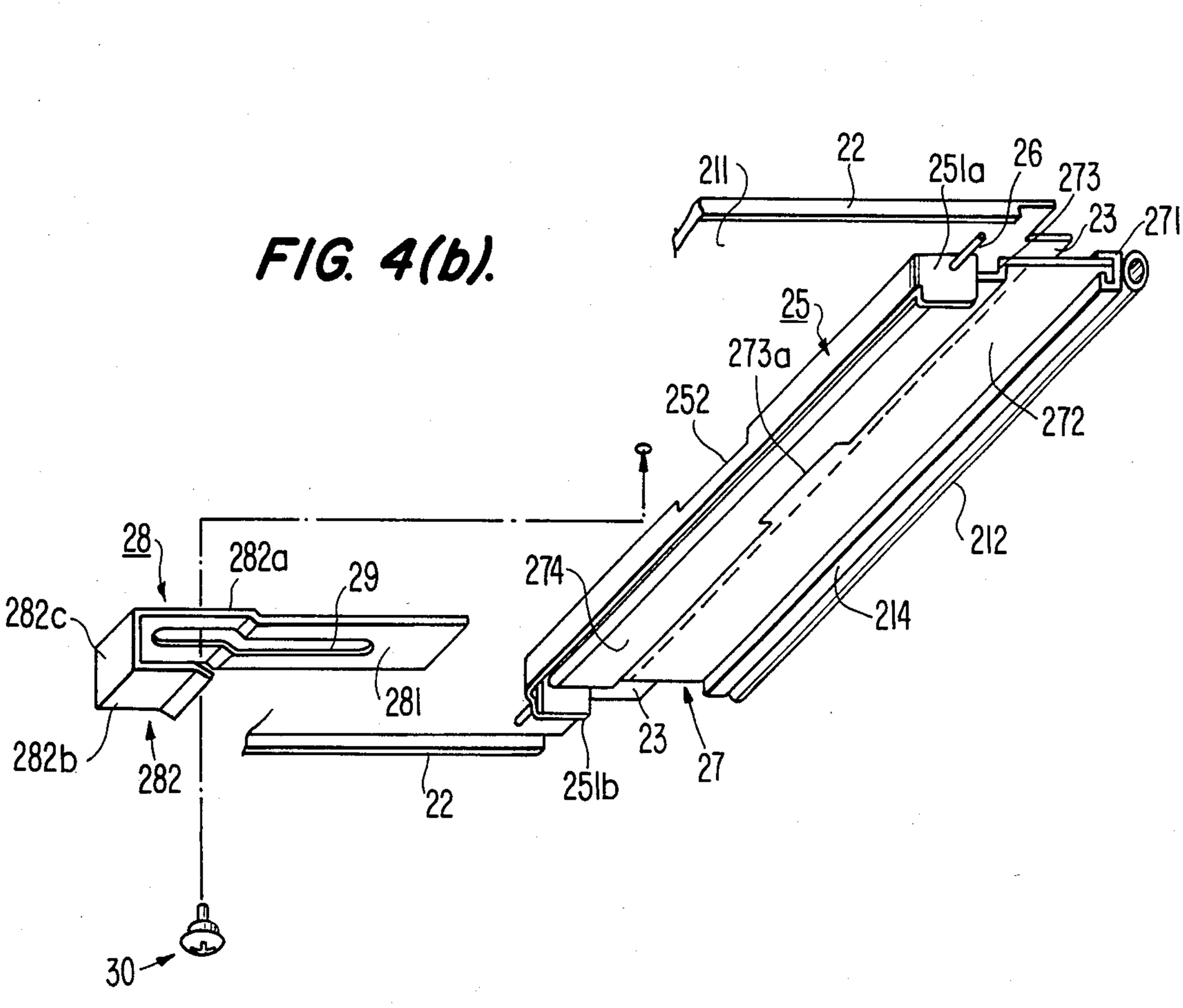

211
22
251a
26
273
23
271
25
273a
252
272
212
28
282a
29
274
214
282c
281
23
27
282b
282
22
251b
30

FIG. 6.

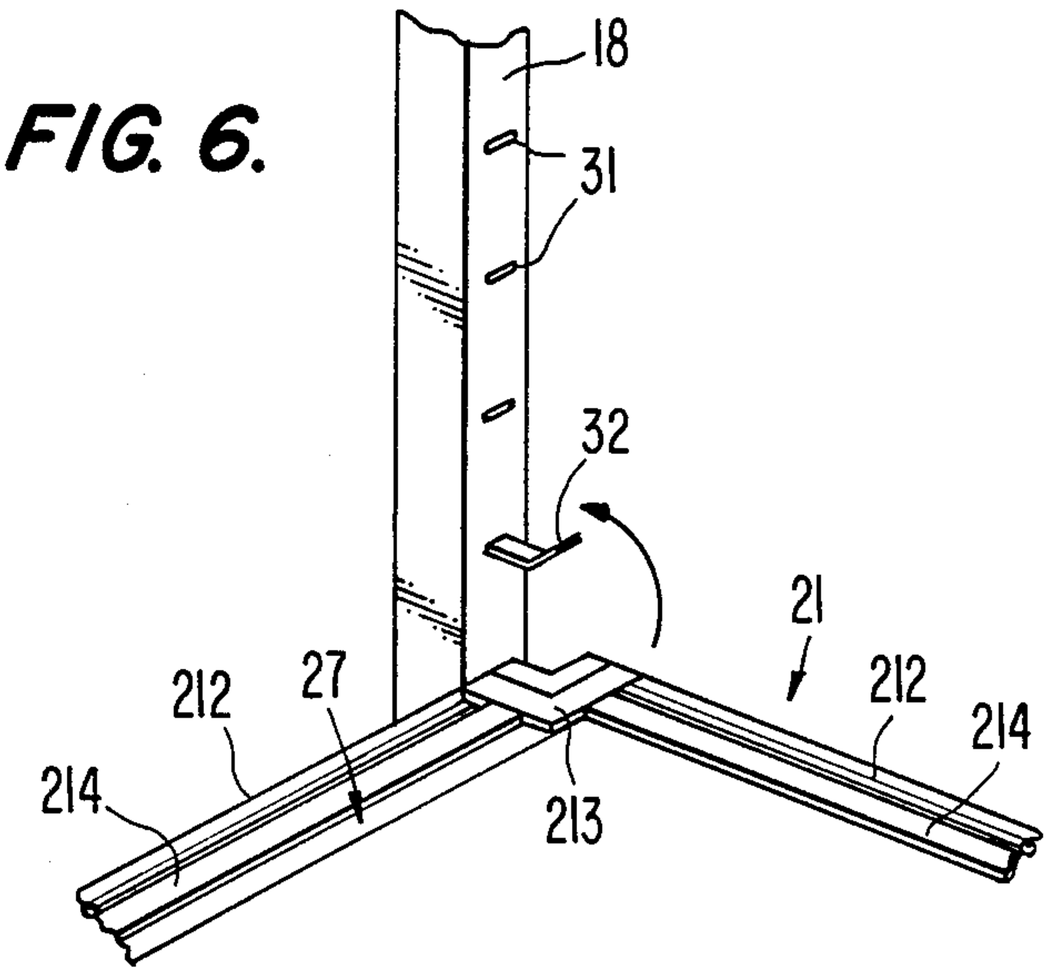


FIG. 7(a).

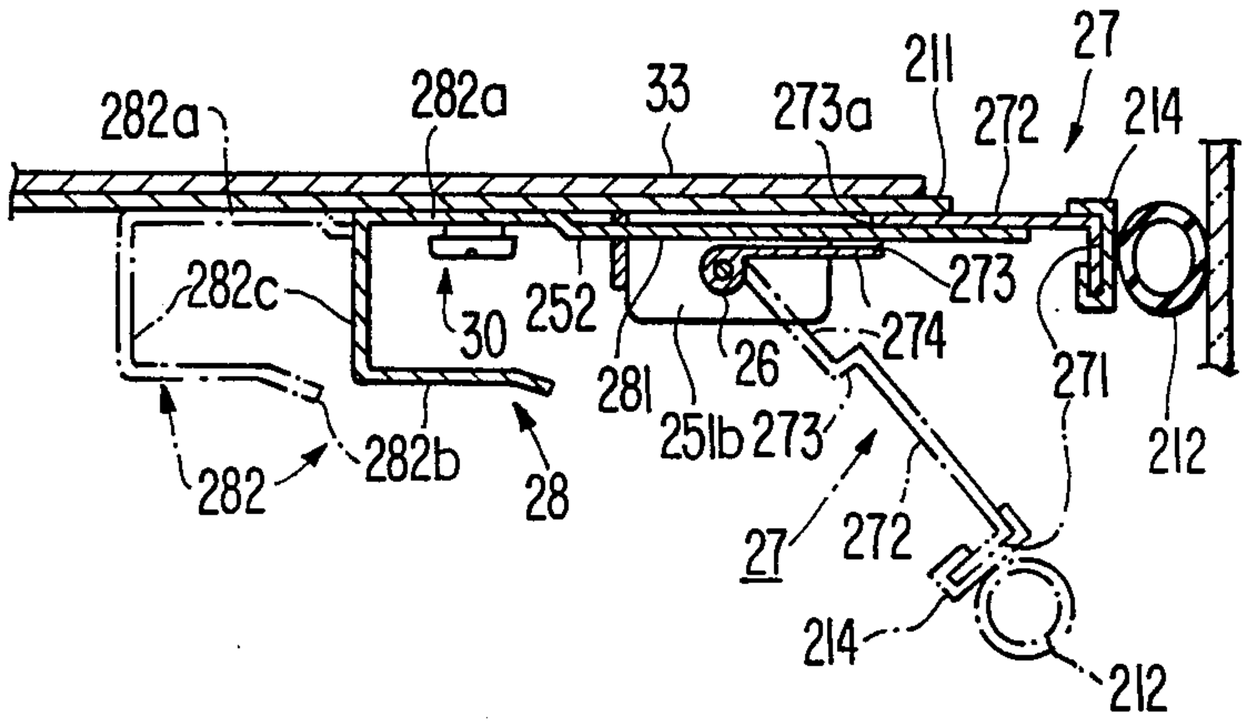


FIG. 7(b).

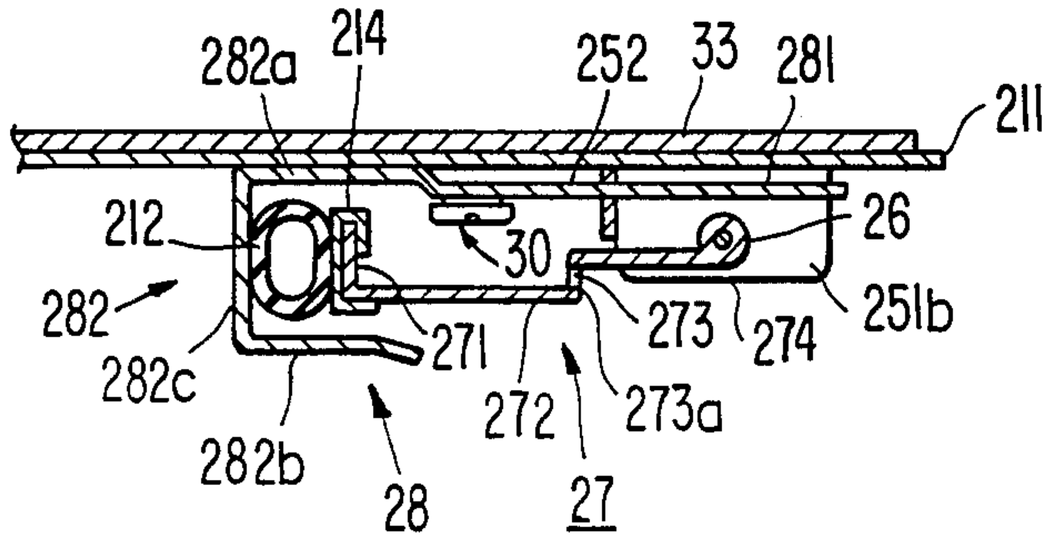


FIG. 8

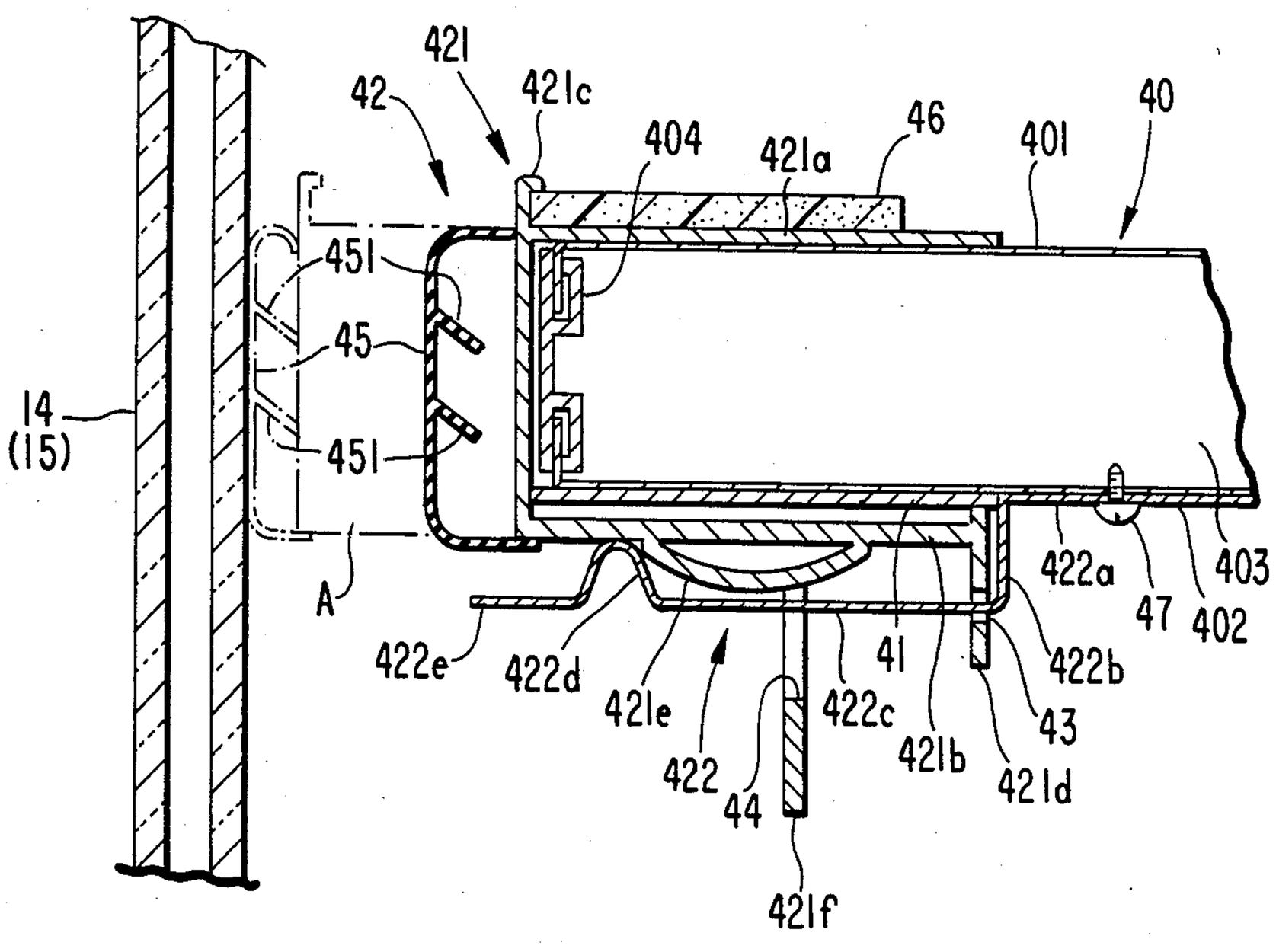
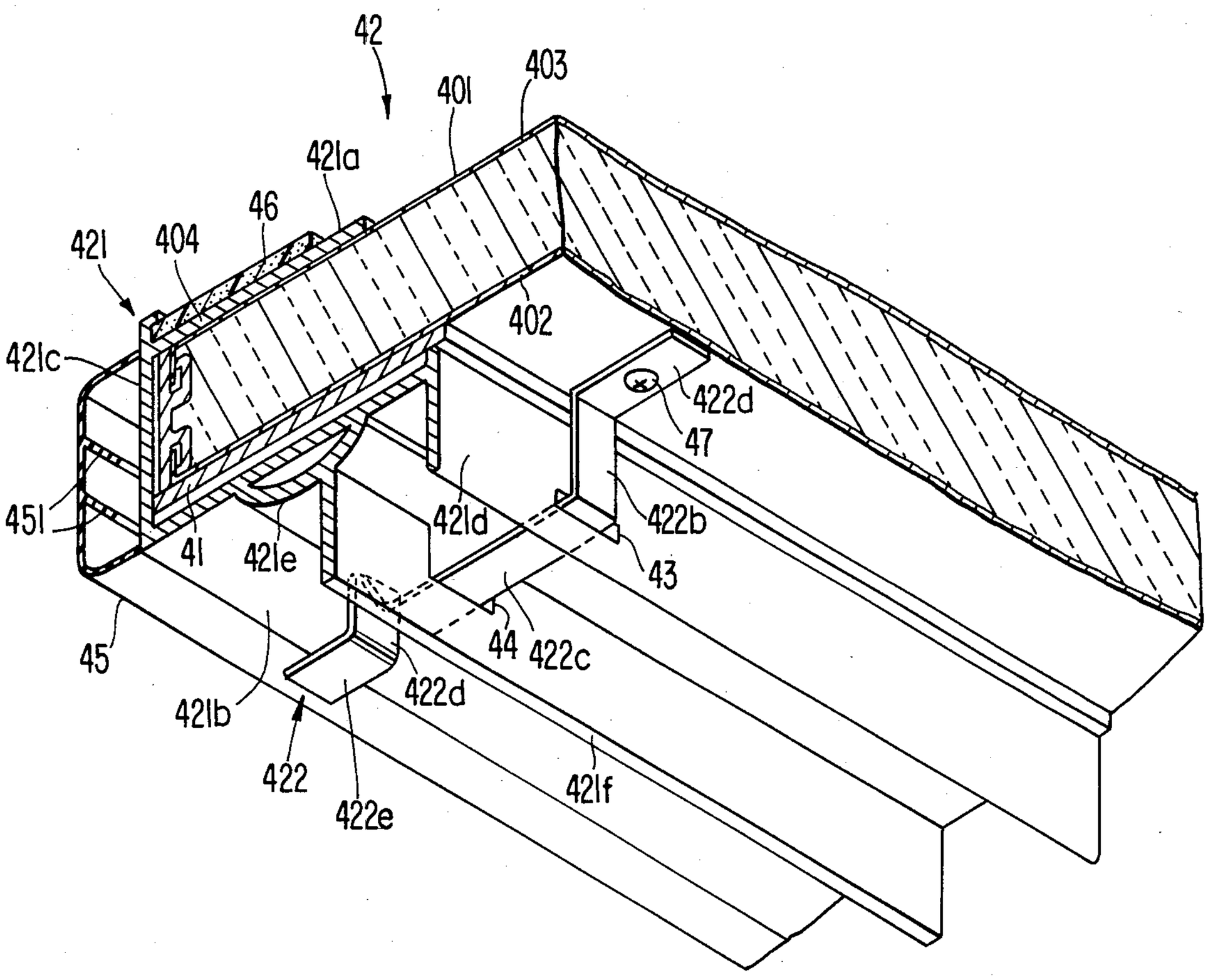

421
42
421c
404
421a
46
401
40
451
45
451
14
(15)
A
422e
422d
421e
422
44
422c
41
421b
43
421d
421f
422a
47
402
403
422b

FIG. 9.


42
401
403
421a
46
421
404
402
421c
422d
47
451
422b
421d
41
421e
43
45
44
422c
422d
421b
422
422e
421f

DISPLAY CABINET

BACKGROUND OF THE INVENTION

This invention relates to the field of merchandise display cases, and more particularly, to a dividing structure for the merchandise display case to provide it with a plurality of merchandise display or storage chambers to maintain different temperature areas.

In conventional merchandise displace cases, such as those used to display frozen foodstuff, beverage cans, etc., transparent glass windows are used to inrease visibility of the merchandise on display and a shelf or plate divides the display/storage compartment of the display case into two chambers, each of which is maintained at a different temperature to define a plurality of merchandise display/storage chambers. Therefore, several kinds of merchandise, each having different keeping temperatures from one another, can be stored within the display/storage chambers of the same case.

With reference to FIGS. **1** and **2**, a conventional refrigerated display case will be described, As shown in FIG. **1**, the refrigerated display case (generally indicated by reference numeral **1**) comprises a merchandise display/storage chamber **5** mounted on a mechanical chamber **2** in which a refrigeration unit is disposed. Display/storage chamber **5** is defined by a front side window **3***a*, right and left side windows **3***b* and **3***c*, top plate **3***d* and door **4**. Door **4** is hingedly supported on the case **1** so as to permit ready access to the interior of display/storage chamber **5**. At least the side windows **3***a*, **3***b* and **3***c* are made of transparent material to increase the visibility of the merchandise stored in the display case.

In this structure of the display case, the interior of display/storage chamber **5** is divided into at least two chambers **5***a* and **5***b* by a plate **6**, providing, for example, a heating chamber **5***a* formed in the upper portion of display/storage chamber **5** and a refrigerating or freezing chamber **5***b* formed below the heating chamber **5***a* and cooled down by the refrigerator unit. Therefore, different types of merchandise, each of which requires a different temperature for storing, can be stored within the same case.

On the other hand, both chambers **5***a* and **5***b* are connected to one another through a duct mechanism **7** disposed on the opposed peripheral edges of plate **6** to enable use of the display/storage chamber **5** as a wholly refrigerating or wholly heating chamber. Duct mechanisms **7**, one being shown in FIG. **2**, comprise an air passageway **7***a* defined between the side windows **3***b* and **3***c*, and the oppsite end surfaces of plate **6**. A damper **7***b* extends horizontally within passageway **7***a* for opening and closing passageway **7***a*. Damper **7***b* is manually operated to accommodate the type of stored merchandise, i.e., if damper **7***b* is open to thereby open passageway **7***a*, the whole space of chamber **5** functions as a refrigerating chamber or a heatin chamber. Conversely, if damper **7***b* is closed to close passageway **7***a*, then the two chambers **5***a* and **5***b* defined by plate **6** are capable of being used as different temperature spaces. However, sine duct mechanisms **7** are disposed on the outer ends of plate **6** and therefore open to view, the appearance of the display case is not as good as desired.

SUMMARY OF THE INVENTION

It is a primary object of this invention to provide an improved display case with a chamber dividing mechanism which affords good visibility of the merchandise stored in the display case.

It is another object of this invention to provide a display case which is provided with an easily operated chamber dividing mechanism.

It is still another object of this invention to provide a display case provided with a chamber dividing mechanism which is disposed in the merchandise display space without interferring with the merchandise.

A display case in accordance with the present invention includes a compartment which stores merchandise for display. The display compartment is defined by a front side window, right and left side windows, a top plate portion and a door, and is divided into at least two chambers by a partition plate. The temperature condition of each chamber may be varied by controlling the opening and closing of a communication gap defined between an edge portion of the partition plate and the right or left side window. A sealing mechanism is disposed in the communication gap to control the opening and closing of the gap, and includes a sealing element movably engaged with the partition plate and a retaining element to hold the selected position of the sealing element.

Further objects, features and other aspects of this invention will be better understood from the following detailed description of preferred embodiments of this invention taken with reference to the annexed drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a display case known in the prior art.

FIG. **2** is an enlarged cross sectioal view illustrating the sealing structure for the partition plate used in the display case of FIG. **1**.

FIG. **3** is a perspective view of a display case in accordance with the present invention.

FIG. **4**(*a*) is an exploded perspective view illustrating a partition plate utilized in the display case of FIG. **3**.

FIG. **4**(*b*) is an enlarged exploded perspective view illustrating a damper element disposed on the partition plate of FIG. **4**(*a*).

FIG. **5** is a perspective view of heating equipment used in the display case of FIG. **3**.

FIG. **6** is an exploded perspective view illustrating the supporting structure for the partition plate on the frame of the display case.

FIGS. **7**(*a*) and **7**(*b*) are enlarged cross sectional views of the damper element and part of the partition plate illustrating the operation of the damper element.

FIG. **8** is an enlarged sectional view of the partition plate and sealing element in accordance with another embodiment of the present invention.

FIG. **9** is a sectional perspective view illustrating the sealing element and part of the partition plate of FIG. **8**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. **3** and **4**, a display case in accordance with one embodiment of the present invention is shown. The display case is generally indicated by reference numeral **10** and includes a mechanical chamber **11** within which a refrigerating unit is disposed, and a merchandise display compartment **12** which is disposed above mechanical chamber **11** and maintained at a de-

sired predetermined temperature by operation of the refrigerating unit and/or heating equipment.

Display compartment **12** is defined by front side window **13**, right and left side windows **14** and **15**, a top plate portion **16** and a hinged door **17**. The side windows **13**, **14** and **15** are assembled with one another by means of frame poles **18**. Door **17** comprises frame element **171** and clear window element **172**. Frame element **171** is attached to the rear side edges of top plate portion **16**, and right and left side windows **14** and **15** to define a rear opening for ready access to display compartment **12**. Sealing of the rear opening with respect to door **17** is accomplished by a seal element (not shown) disposed between frame element **171** and the side windows as is known in the art.

A plurality of shelves **20** and at least one partition plate **21** are disposed within display compartment **12** to define a plurality of display/storage spaces. Particularly, partition plate **21** divides the display compartment **12** into two different temperature chambers, such as a refrigerating chamber R and heating chamber H. As clearly shown in FIG. **3**, the refrigerating chamber R is positioned in the lower portion of display compartment **12** and is refrigerated by the refrigerating unit in mechanical chamber **11** and heating chamber H is positioned above the refrigerating chamber R and heated by a heating element mounted on partition plate **21**.

Partition plate **21** comprises a central base plate **211**, packing elements **212** having an annular shaped cross section which are made of soft resin material and L-shaped corner spacers **213**. Each packing element **212** is affixed to an attaching element **214** for fixedly disposing element **212** on base plate **211**. An inner edge portion of each corner spacer **213** is provided with a thin plate portion which is pressed into contact against the frame pole **18** to secure sealing between corner spacer **213** and frame pole **18**. A downwardly bent flange portion **22** is formed on a pair of opposed edges of base plate **211** and a projecting portion **23** is formed on the other pair of opposed edges of base plate **211**. The outer edge of corner spacer **213** is engaged with flange portion **22** and projecting portion **23** to support spacer **213**. Packing element **212** is supported on flange portion **22** by means of attaching element **214**.

A support element **25** extends fromand is fixed on the underside surface of the adjacent projecting portion **23** of base plate **211**. Element **25** has supporting flanges **251***a* and **251***b* at both end portions and a cut-out portion **252** at its upper central portion. A supporting shaft **26** extends along support element **25** to be rotatably supported on supporting flanges **251***a* and **251***b*.

A damper element **27** is pivotally supported on supporting shaft **26** and comprises a first downwardly bent flange portion **271**, a first flat surface portion **272** extending horizontally from the base of first flange portion **271**, a second downwardly bent flange portion **273** formed at the other edge of the first flat surface portion **272**, and a second flat surface portion **274** extending horizontally from the lower edge of second flange portion **273**. The other end of the second flat surface portion **274** is attached to supporting shaft **26**. Therefore, damper element **27** is mounted to swing around supporting shaft **26**. One packing element **212** is also disposed and fastened on the first flange portion **271** of damper element **27** through attaching element **214**. The second flange portion **273** is formed with a hole **273***a* which is aligned with cut-out portion **252** in support element **25**.

A holding element **28** is slidably attached on the undersurface of base portion **211** of partition plate **21**. Element **28** comprises a holding portion **281** and U-shaped support base portion **282**. Holding portion **281**, the upper and lower flanges **282***a* and **282***b* of support base portion **282** are all parallel to each other. Holding portion **281** connects with upper flange **282***a* through a small step portion so as to continue beneath upper flange **272** of damper **27** as shown on FIG. **7**(*a*). An elongate slot **29** is formed on holding portion **281** and upper flange **282***a*. Holding element **28** is fastened on the undersurface of base portion **211** by a screw **30** which passes through elongated slot **29**. Therefore, holding element **28** is permitted to slide along the undersurface of base portion **211** with screw **30** remaining loose.

A plurality of hook holes **31** are formed on the inner surface of the respective frame poles **18** as shown on FIG. **6** for receiving a supporting element **22**. As shown in FIG. **6**, each corner spacer **213** is hung on each frame pole **18** through supporting elements **32**. Therefore, partition plate **21** is fixedly mounted in display compartment **12**. At this time, the thin plate portion of spacer **213** is firmly contacted against the inner surface of frame pole **18**. Also, the position of partition plate **21** can be easily changed by changing the hook position of supporting elements **32**.

The operation of damper element **27** will be described with reference to FIG. **7**(*a*) and **7**(*b*). When the display compartment **12** is to be used as a refrigerating chamber and a heating chamber to store refrigerated and heated merchandise within the same case, each packing element **212** should be in pressure contact against the inner surface of respective windows, as shown inFIG. **7**(*a*). That is damper element **27** is rotated to have the first flat surface portion **272** pressed against the undersurface of base portion **211** and the holding portion **281** of holding element **28** is inserted into hole **273***a* of the second flange portion **273** after passing through the cut-out portion **252** of supporting element **25**, this action taking place due to sliding motion of holding element **28**. At this time, holding portion **281** of holding element **28** contacts with the undersurface of the first flat surface portion **272** of damper element **27**. Therefore, damper element **27** is held in its position by holding element **28**. Thus the sealing structure between refrigerating chamber R and heating chamber H is completed by means of damper element **27** carrying packing element **212**.

On the other hand, if display compartment **12** is to be used solely as a refrigerating chamber, damper element **27** should be retained by holding element **28** to establish an air gap between each of the windows and the partition plate **21** such as is shown in FIG. **7**(*b*) to enable the circulation of cooled air within the whole space of display compartment **12**. If the holding portion **281** of holding element **28** is retracted from hole **273***a* in the second flange portion **273** due to inward sliding motion of holding element **28**, damper element **27** can be swung downwardly, this position being shown in two-dot and dash lines in FIG. **7**(*a*).

Thereafter, damper element **27** is further rotated to a position whereat the first and second flat surface portions **272** and **274** are parallel with the base portion **211** and the holding element **28** has been slid outwardly. Thus, the ouer end portion of damper element **27** including packing element **212** is received in the U-shaped support base portion **282** of holding element **28** as shown in FIG. **7**(*b*). In this position, damper element **27**

is fixedly supported by the holding element **28** to establish the air gap between the inside surface of each of the side windows and the partition plate **21**. Therefore, the cooled air can be circulated within the entire space of display compartment **12** to thereby refrigerate both refrigerating chamber R and heating chamber H.

Alternatively, the entire space of display compartment **12** can be used as a heating chamber if operation of the refrigerating unit is ceased and a heating element is put in the display compartment **12**. Thus heating equipment **33** is disposed on base portion **211** of partition plate **21**. Alternatively, the heating equipment may be separately hung on frame poles **18** through hook pins **331** projecting therefrom. The separately hung heating equipment **33'** is shown in FIG. **5**.

As mentioned above, the partition and communication between the refrigerating chamber and heating chamber is effectively controlled by swinging operation of the damper element together with its packing element and the damper element is held in the desired position by sliding operation of the holding element. Therefore, the temperature of each divided space is easily changed due to the ease of operation of the damper element. Also, if the damper element is not used, the damper element may be housed in the holding element to extend along the undersurface of the partition plate. Thus, the visibility of the merchandise in the display compartment is not in any way obstructed by the damper element. Furthermore, the partition plate position can be varied in accordance with the required space area to display and store the merchandise by changing the hanging position of the supporting elements.

In the above mentioned partition plate with damper element, if the damper element has its position changed to change the temperature conditions in the chambers due to swinging motion thereof, the damper element may interfere with merchandise stored in the display compartment. Therefore, merchandise placed in the swinging area of the damper element should be moved out of this area, even if sealing between the refrigerating chamber and the heating chamber is secured with ease of operation. One resolution of this problem is shown in FIG. **8** which shows a modified partition plate with sealing structure.

Referring to FIG. **8**, partition plate **40** comprises an upper plate **401**, lower plate **402** and insulation material, for example, a silicon cotton **403** which is disposed between the upper and lower plates **401** and **402**. Each peripheral edge of plate **40** is covered by a holding frame **404** engaged with the upper and lower plates **401** and **402**. A sliding plate **41** is attached on the outer edge under portion of lower plate **402**. Partition plate **40** is disposed in the display compartment of the display case and an air gap A is defined at the edge surface of partition plate **40** between each of the right and left side windows **14** and **15**.

A closing element **42** is slidably disposed on the outer peripheral portion of partition plate **40** to control the opening and lcosing of air gap A. Closing element **42** includes a closing frame **421** slidably disposed on partition plate **40** and a leaf spring **422** to control the horizontal movement of closing frame **421**. closing frame **421** is formed to have a U-shaped cross section consisting of an upper plate element **421***a*, lower plate element **421***b* and end plate element **421***c* connected between the upper and lower plate elements at its ends. A vertical flange portion **421***d* which is disposed on the end portion of lower plate element **421***b* and a curved portion **421***e* which is located on the end surface of lower plate element **421***b* are integrally formed with closing frame **421**. A second verticle flange portion **421***f* projects from the outer surface of curved portion **421***e* and is also integrally formed with closing frame **421**. Vertical flange portion **421***d* and second vertical flange portion **421***f* are formed with rectangular shaped holes **43** and **44**, respectively, these holes being aligned with one another.

A U-shaped packing element **45** made of vinyl chloride is disposed on the end portion of partition plate **40** to secure sealing between the window and the closing element without damage to the window. Packing element **45** has a plurality of projections **451** extending generally horizontally from the inner surface thereof to increase the durability of the packing element. Also, insulation plate **46** made of foam polyethylene is disposed on the upper surface of the upper plate element **401**.

Leaf spring **422** is formed with an L-shaped and provided with a fastening portion **422***a* extended from vertical portion **422***b*. Leaf spring **422** is fastened on lower plate **402** of partition plate **40** by a screw **47** extending through fastening portion **422***a*. A free end of horizontal portion **422***c* of leaf spring **422** is provided with a U-shaped retaining portion **422***d* and free terminal end **422***e*. Horizontal portion **422***c* extends horizontally along lower plate element **421***b* and passes through rectangular holes **43** and **44** of closing frame **421**. Retaining portion **422***d* is normally disposed on the outer side of the second vertical flange portion **421***f* and presses upwardly to contact against the lower plate element **421***b* and curved portion **421***e* of closing element **42** due to the biasing strength of leaf spring **422**.

In the above construction of closing element **42**, if the display compartment **12** is used as a refrigerating chamber and also as a heating chamber, closing element **42** should be slid by grapsing second vertical flange **422***f* toward the side window **14** or **15**, opposing the biasing strength of leaf spring **422**. At this time, packing element **45** is firmly contacted against the side window **14** or **15** to secure sealing or closure of air gap A. This position of the closing element is shown by two-dot and dash lines in FIG. **8**. When closing element **42** is positioned to seal the air gap A, retaining portion **422***d* of leaf spring **422** is positioned between curved portion **421***e* and vertical flange portion **421***d* in pressure contact with lower plate element **421***b* of closure framer **421**. Therefore, the position of closing frame **421** is securely maintained.

On the other hand, if display compartment **12** is entirely used as a refrigerating chamber or heating chamber, closure element **42** should be shifted to the peripheral edge of partition plate **40** to establish the air gap A. This position is shown in solid lines in FIG. **8**. At this time, retaining portion **422***d* of leaf spring **422** is disposed on the outer edge of curved portion **421***e*. Therefore, sliding movement of closing element **421** is prevented to thereby maintain the opening of air gap A.

A mentioned above, the closing frame to control the openign and closing of the air gap defined between the side window and partition plate is slidably disposed on the peripheral edge portion of the partition plate and movement of the closing frame is controlled by the leaf spring. Therefore, each of the display/storage chambers formed in the display compartment is easily changed as

to temperature conditions and control of the closure frame without interferring with the stored merchandise.

This invention has been described in detail in connection with preferred embodiments. However, the embodiments are merely for example only and the present invention is not to be restricted thereto. It will be easily understood by those skilled in the art that other variations and modifications can be made within the scope of this invention as defined by the appended claims.

We claim:

1. In a display case including a mechanical chamber having a refrigeration unit disposed therein and provided with a compartment for display and storage of merchanidse, said display compartment being defined by a front window, right and left windows, a top plate portion and hinged door, and said front, right and left windows being attached together by frame elements, at least one impervious partition plate disposed within said display compartment to divide said compartment into two chambers, a gap defined between at least one of said windows and an edge portion of said partition plate for said chambers to communicate with one another through said gap to vary the temperature condition of each of said chambers by opening and closing said gap, and a sealing mechanism to control opening and closing said gap, the improvement comprising said sealing mechanism including a sealing element movably engaged with said partition plate to engage with at least one of said windows so as not to allow air to pass through said gap when such window is engaged and a retaining element to hold the selected position of said sealing element.

2. The display case of claim **1** wherein said sealing element is a damper pivotally supported on the underside surface of said partition plate, and said retaining element is attached on said underside surface of said partition plate.

3. The display case of claim **2** wherein said retaining element is formed as a tang-shaped plate to extend along and slidably engage said underside surface of said damper, said plate being slidably attached on said partition plate.

4. The display case of claim **3** wherein said retaining element has a U-shaped holding portion at one end portion for receiving the outer end portion of said damper when said damper is moved to a position to open said gap.

5. The display case of claim **2** wherein said damper is provided with a packing element at its outer end surfce for securing the sealing of the gap without damage to said window.

6. The display case of claim **1** wherein said sealing element is formed with a U-shaped cross section for receiving the outer end portion of said damper when said damper is moved to a position to open said gap, said sealing element being slidably disposed on an outer edge portion of said partition plate.

7. The display case of claim **6** wherein said retaining element is a leaf spring which is provided with a contact portion pressed against said sealing element due to the biasing strength thereof.

8. The display case of claim **6** wherein said sealing element is provided with a packing element on its outer end portion to secure sealing of the gap without damage to said window.

9. The display case of claim **6** wherein said seal element has a holding portion for easy movement thereof.

* * * * *